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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of — Atty. Docket

RONALDUS M. AARTS ET AL. — PHN 17,835

Serial No.: 09/741,918 — Group Art Unit: 2644

Filed: December 20, 2000 — Examiner: Laura A. Grier

Title: MULTI-CHANNEL AUDIO SIGNAL PROCESSING DEVICE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Enclosed is an original copy of an Appeal Brief in the above-identified patent application.

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Respectfully submitted,

By _____
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CERTIFICATE OF MAILING

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APPEAL BRIEF

This is an appeal from the Examiner of Group 2644 finally rejecting claims 1-8 in this application.

(i) Real Party in Interest

The real party in interest in this application is U.S. PHILIPS CORPORATION by virtue of an assignment from the inventors recorded on June 4, 2001, at Reel 11864, Frames 0960-0961.

(ii) Related Appeals and Interferences

There are no other appeals and/or interferences related to this application.

(iii) Status of the Claims

Claims 1 & 8 stand rejected, while claims 2-7 are objected to as being dependent upon a rejected parent claim, but would be allowable if rewritten in independent form. The rejection of claim 1 is hereby being appealed.

(iv) Status of Amendments

A first response under 37 C.F.R. 1.116 was filed on July 7, 2004, in response to a Final Rejection of the claims on June 4, 2004. An Amendment under 37 C.F.R. 1.116 was also filed on September 7, 2004 (making claims 2-7 independent).

(v) Summary Of Claimed Subject Matter

The subject invention relates to a multi-channel audio signal processing device which receives coded audio signals through several input channels, the coded audio signals in each channel being divided into sub-band signals each covering a distinct frequency sub-band domain. Such a multi-channel audio signal processing device includes one or several synthesis filters for decoding and synthesizing the audio signals over the total frequency domain covered by the sub-band domains.

As shown in Fig. 1 and described in the Substitute Specification on page 4, line 23 to page 5, line 17 (paragraph [0013]), input signals in the form of sub-band audio signals are

provided via a plurality of channels CH1 - CHn. In prior art devices, the sub-band audio signals for each channel are decoded separate synthesis filter banks SFB1 - SFBn. In the case of a 5-channel input audio signal, then there are 5 synthesis filter banks. The outputs from these synthesis filter banks SFB1 - SFBn are then supplied, through separate main-related filters ISF1 - ISFn, to combination circuits C for combining the decoded channel signals into separate output channel signals (e.g., two output channels - left and right) for application to separate loudspeakers.

The subject invention seeks to limit the number of these synthesis filter banks to only the number of reproduction (output) channels. As described in the Substitute Specification on page 5, line 18 to page 6, line 3 (paragraph [0014]), the input sub-band audio signals from each input channel CH1 - CHn are applied directly to separate combination circuits SBS1 - SBSn on the basis of the particular sub-band. The outputs from these combination circuits are then applied, through respective equalization filters H1 - Hn, to synthesis filter banks SFB for each reproduction (output) channel, wherein the synthesis filter banks decode and combine the combined sub-band signal outputs of the separate combination circuits.

(vi) Grounds of Rejection to be Reviewed on Appeal

Whether the invention, as claimed in claim 1 is anticipated, under 35 U.S.C. 102(e), by U.S. Patent 6,478,535 to Smyth et al.

(vii) Arguments

The Smyth et al. patent discloses a multi-channel audio encoder in which a plurality of input channels (e.g., CH 1 - CH 5) are applied to respective channel encoders 26 "that produce respective sets of encoded subband signals 28, suitably 32 subband signals per channel." (col. 6, lines 61-63) As described at col. 7, lines 39-43, "a multiplexer 32 multiplexes the subband signals and side information into the data stream 16 in accordance with a specified data format." Further, at col. 31, lines 39-41, Smyth et al. states that the multiplexer 32 "packs the data for each channel and then multiplexes the packed data for each channel into an output frame to form the data stream 16." In describing the decoder, Smyth et al. states, at col. 40, lines 16, "After synchronization, the unpacker 40 unpacks the compressed audio data stream 16, detects and if necessary corrects transmission induced errors, and demultiplexes the data into individual audio channels. The subband differential signals are requantized into PCM signals and each audio channel is inverse filtered to convert the signal back into the time domain. It should be apparent that Smyth et al. is intent on providing reconstructed signals on output channels

corresponding to the input audio signals on the input channels of the encoder. There is no disclosure in Smyth et al. of combining these reconstructed signals to form "reproduction" channels of a different number than the output channels of the decoder. For example, in the case that the decoder supplies 5 output channels, there is no disclosure as to how and what means should be used to combine these channels to form, for example, stereo (i.e., 2-channel) reproduction channel. Rather, the demultiplexed channel signals are applied to separate synthesis filter banks, as Appellants have described for the prior art above.

The subject invention concerns the processing of multi-channel audio signals to form reproduction (output) channels which may not correspond in number to the number of input audio channels. As indicated in claim 1, each of the input channels of the multi-channel audio signal is supplied through separate sub-channels covering distinct frequency sub-band domains. However, as claimed in claim 1, the device of the subject invention includes "sub-band combination circuits, each being supplied (from the signal supply means) with audio signals through respective input channels which lie in one and the same sub-band frequency domain..." This is clearly shown in, for example, Fig. 2, in which the first sub-band of each input channel is applied to SBS1 (sub-band combination circuit 1), the second sub-band of each input channel is applied to SBS2, ..., etc. The output signals from these sub-band combination circuits

SBS1-SBSn are applied to respective synthesis or reconstruction filters for forming each output channel.

The Examiner states "In respect the claim 1, and in view of the examiner's interpretation of the claim language of the claim, 'combining the coded audio signals' is not explicitly claimed. For example, the latter limitation of claim 1 in regards to the sub-band combination circuits, the claim merely recites, 'each sub-band combination circuit being supplied with audio signals through respective input channels…'"

Appellants are not sure what the Examiner is trying to say. Appellants do not believe it is necessary in a claim to explicitly state the function of an element if the function is clear from the name of the element. For example, if signal A is applied to one input of an addition circuit, signal B is applied to another input of the addition circuit, and the addition circuit forms an output signal, it should not be necessary to state that the addition circuit adds signals A and B. Similarly, in the present case, as claimed in claim 1, "each sub-band combination circuit being supplied with audio signals through respective input channels which lie in one and the same sub-band frequency domain, while the output signals of a sub-band combination circuit covering an associated frequency sub-domain…". Hence, the output of each sub-band combination circuit is a combination of audio signals from the

respective input channels which are in the same sub-band frequency domain.

The Examiner has stated that in Smyth et al., "The sub-band combination circuits are inherently disclosed as evidence by the fact that the subband are recombined in the decoder to produce a signal PCM audio signal (col. 8, lines 24-34, 63 - col. 9, lines 1-4)."

Appellants do not dispute that Smyth et al. may have some form of sub-band combination circuits. However, Appellants stress that Smyth et al. neither shows nor suggests "each sub-band combination circuit being supplied with audio signals through respective input channels which lie in one and the same sub-band frequency domain, while the output signals of a sub-band combination circuit covering an associated frequency sub-domain are supplied to one of said synthesis filters for each output channel of said multi-channel audio signal processing device." This is clearly shown in Fig. 2, in which each input channel CHn is shown supplying a plurality of sub-band audio signals, wherein the "top" sub-band signal in each input channel is applied to the sub-band combination circuit SBS1, the "second" sub-band signal in each input channel is applied to the sub-band combination circuit SBS2, etc. The outputs from these sub-band combination circuits are applied, through respective equalization filters H1, H2, …, to the synthesis filter SFB. In order for Smyth et al. to reconstruct the PCM signal as applied to

the encoder, any sub-band combination circuit of Smyth et al. would combine all the sub-band signals in a single channel, not intermix the sub-band signals from the various channels as is done in the present invention.

"Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim.", *Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick*, 730 F.2d 1452,1458, 221 USPQ 481, 485 (Fed. Cir. 1984).

Appellants submit that while Smyth et al. may arguably inherently disclose sub-band combination circuits, Smyth et al. neither discloses or suggests arranging these inherently disclosed sub-band combination circuits as is claimed in claim 1.

(viii) Conclusion

Based on the above arguments, Appellants believe that the subject invention is neither anticipated nor rendered obvious by the prior art and is patentable thereover. Therefore, Appellants respectfully request that this Board reverse the decision of the Examiner and allow this application to pass on to issue.

Respectfully submitted,

by _____
Edward W. Goodman, Reg. 28,613
Attorney

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On Nov. 03, 2004

By Burnett James

(viii) Appendix

CLAIMS ON APPEAL

1. (Previously Presented) A multi-channel audio signal processing device comprising:

signal supply means for supplying coded audio signals through several input channels, and for each input channel, through separate sub-channels covering distinct frequency sub-band domains; and

synthesis or reconstruction filters (SFB) for decoding and synthesizing audio signals over the total frequency domain covered by the sub-band domains,

characterized in that said multi-channel audio signal processing device further comprises:

sub-band combination circuits, each sub-band combination circuit being supplied with audio signals through respective input channels which lie in one and the same sub-band frequency domain, while the output signals of a sub-band combination circuit covering an associated frequency sub-domain are supplied to one of said synthesis filters for each output channel of said multi-channel audio signal processing device.

2. (Previously Presented) A multi-channel audio signal processing device comprising:

signal supply means for supplying coded audio signals through several input channels, and for each input channel, through separate sub-channels covering distinct frequency sub-band domains; and

synthesis or reconstruction filters (SFB) for decoding and synthesizing audio signals over the total frequency domain covered by the sub-band domains,

characterized in that said multi-channel audio signal processing device further comprises:

sub-band combination circuits, each sub-band combination circuit being supplied with audio signals through respective input channels which lie in one and the same sub-band frequency domain, while the output signals of a sub-band combination circuit covering an associated frequency sub-domain are supplied to one of said synthesis filters for each output channel of said multi-channel audio signal processing device; and

filter means coupled to inputs of the respective synthesis filters.

3. (Previously Presented) A multi-channel audio signal processing device comprising:

signal supply means for supplying coded audio signals through several input channels, and for each input channel, through separate sub-channels covering distinct frequency sub-band domains; and

synthesis or reconstruction filters (SFB) for decoding and synthesizing audio signals over the total frequency domain covered by the sub-band domains,

characterized in that said multi-channel audio signal processing device further comprises:

sub-band combination circuits, each sub-band combination circuit being supplied with audio signals through respective input channels which lie in one and the same sub-band frequency domain, while the output signals of a sub-band combination circuit covering an associated frequency sub-domain are supplied to one of said synthesis filters for each output channel of said multi-channel audio signal processing device; and

filter means coupled between the relevant sub-band combination circuits and the respective synthesis filter.

4. (Previously Presented) A multi-channel audio signal processing device comprising:

signal supply means for supplying coded audio signals through several input channels, and for each input channel, through

separate sub-channels covering distinct frequency sub-band domains; and

synthesis or reconstruction filters (SFB) for decoding and synthesizing audio signals over the total frequency domain covered by the sub-band domains,

characterized in that said multi-channel audio signal processing device further comprises:

sub-band combination circuits, each sub-band combination circuit being supplied with audio signals through respective input channels which lie in one and the same sub-band frequency domain, while the output signals of a sub-band combination circuit covering an associated frequency sub-domain are supplied to one of said synthesis filters for each output channel of said multi-channel audio signal processing device; and

filter means coupled between the input sub-channels and inputs of the sub-band combination circuits.

5. (Previously Presented) The multi-channel audio signal processing device as claimed in claim 4, characterized in that the filter means comprise elements for introducing a scale factor.

6. (Previously Presented) The multi-channel audio signal processing device as claimed in claim 2, characterized in that the filter means comprise filters for obtaining a desired virtual

spatial widening from which the audio signals can be heard through separate reproduction channels.

7. (Previously Presented) The multi-channel audio signal processing device as claimed in claim 2, characterized in that the filter means comprise equalization filters or tone control filters of an alternative kind.

8. (Previously Presented) A method for processing an audio signal comprising the steps:

receiving coded audio signals in different frequency sub-band areas;

combining the coded audio signals in different frequency sub-bands to form combined signals; and

synthesis filtering and decoding the combined signals.